

PEER REVIEW HISTORY

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This paper was submitted to a another journal from BMJ but declined for publication following peer review. The authors addressed the reviewers' comments and submitted the revised paper to BMJ Open. The paper was subsequently accepted for publication at BMJ Open.

(This paper received three reviews from its previous journal but only two reviewers agreed to published their review.)

ARTICLE DETAILS

TITLE (PROVISIONAL)	An ecological study on the use of hormonal contraception, abortions and births among teenagers in the Nordic countries
AUTHORS	Hognert, Helena; Skjeldestad, Finn Egil; Gemzell-Danielsson, Kristina; Heikinheimo, Oskari; Milsom, Ian; Lidegaard, Øjvind; Lindh, Ingela

VERSION 1 – REVIEW

REVIEWER	David Paton Nottingham University Business School, United Kingdom
REVIEW RETURNED	16-Mar-2018

GENERAL COMMENTS	<p>This paper presents an overview of trends in teenage pregnancy and use of hormonal contraception in Nordic countries. Teenage pregnancy and abortion rates have decreased in all Nordic countries in recent years. The countries display different trends in use of hormonal contraception over the same period though there has been an increase in the use of LARCs in all countries. On the basis of these trends, the authors argue for improved access to the most effective forms of contraception for teenagers.</p> <p>Describing the experience of Nordic countries is potentially a useful exercise, particularly in relation to LARCs. There have been relatively few papers examining the impact of LARCs on teenage pregnancy. Understanding the experience of Nordic countries in this area helps to provide more background to the issue. You need to be careful, though. Given that your study is descriptive, it can tell us very little about the causal effect of policy interventions.</p> <p>The key recent change in behaviour is greater take-up of LARCs. I think the authors should focus more clearly on this. First, given that LARCs were of very little importance until 2000 at the earliest, the presentation of trends in pregnancy & abortion should focus on a more recent period than 1975 (see Figure 1 a-c).</p> <p>Another issue is that it is difficult to pick out trends in LARCs in figures 2 and 3: use of the pill is still much higher than LARCs in every country which means the scale of the Figures makes it hard to pick out what has happened to LARCs. I would present Figures 2 & 3 in two parts: first total hormonal contraception (as at present) and then LARCs on their own. If space is tight, then just present</p>
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	<p>the latter.</p> <p>A tighter focus on trends in LARCs will allow you to make some more observations about possible impacts. From what I can see, Denmark has seen a much slower rate of increase in the use of LARCs than Norway or Sweden. Yet, I don't see any strong evidence that teenage pregnancy rates have reduced slower in Denmark. You are not trying to test causation here, but that would be consistent with the evidence from the (limited) literature that access to LARCs does not seem to have much impact on pregnancy rates. Indeed, other observations in the paper, e.g. that there seems to be no obvious link between overall use of hormonal contraception and teenage pregnancies (p.9) or between contraceptive subsidies and teenage pregnancy (p.11), fits in quite well with the more general findings in the literature that access to birth control has very little impact on teenage pregnancy rates. You should emphasise this overall point more.</p> <p>Some specific comments</p> <p>Abstract: "A secondary aim was to explore plausible explanations for possible differences" I didn't understand this aim. Do you mean differences over time, between countries or between different age groups? The same comment applies to the bottom of p.4.</p> <p>p.4: Ireland is another Northern European country but with very low rates of teenage pregnancy and teenage abortion (latter based on figures of abortions on Irish teens in Great Britain). It is definitely worth a mention here.</p> <p>p.7: as mentioned above, I would focus on birth & abortion rates over the period from when LARCs first started being more easily available, i.e. from after 2000.</p> <p>p.9: "This indicates high fertility awareness, and effective prevention of unplanned pregnancies by the use of highly effective contraceptive methods". This is incorrect – a reduction in births without abortion rates going up does necessarily indicate this at all. It could just as easily indicate a reduced preference for teenage births caused by some other change in society. It is noteworthy that similar trends have been observed in many countries across the world including those with and without high levels of use of LARCs. I would just delete this sentence.</p> <p>The same comment applies to the first sentence at the top of p.10. Given that abortion rates have gone down in countries irrespective of their approach to LARCs, there is no evidence from this paper that the shift towards LARCs is one reason for the decline in abortion rates. It is quite possible that this is an explanation, but the paper does not give any test of a such a causal influence.</p> <p>p.11: "Sexuality education programmes have been suggested to lower teenage pregnancy rates ..." Goesling et al (2014) is cited here but that paper does not support the statement. Goesling looks at individual programmes most of which are not sexuality education. Of the 25 programmes which examine in teen pregnancies, only 5 led to a reduction. Of these, most were more general youth development programmes rather than sexuality education. A better cite would be the 2016 Cochrane Review of sex education programmes by Mason-Jones et al which found no evidence that such programmes led to reductions in teenage</p>
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	<p>pregnancy. This is a fairly typical finding so the sentence here should be re-written as something like “Although it is sometimes suggested that sexuality education programmes lower teenage pregnancy rates, there is little evidence to suggest this is the case ...”</p> <p>p.11-12 Similarly, the authors should note that most of the literature suggests that subsidised contraception has rarely been found to have any significant impact on teenage pregnancy rates. Specifically on LARCs, the authors should cite Girma & Paton in Social Science and Medicine (2015) which tests the impact of greater access to LARCs on teenage pregnancy rates.</p> <p>p.12: the para beginning “In conclusion ...” needs a significant re-write. The paper is descriptive in nature and so says very little or nothing about what factors have led to lower teenage pregnancy in Nordic countries. As noted above, many countries have experienced a reduction on teenage pregnancy and abortions in the past 10 years or so and these countries have a range of experiences in relation to access to contraception. The problem could largely be solved by deleting two sentences: “A multifactorial approach...” and “Thus, interventions that increase ...”</p>
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REVIEWER	Gilda Sedgh Guttmacher Institute, USA
REVIEW RETURNED	09-Apr-2018

GENERAL COMMENTS	<p>This is an interesting paper on an interesting topic. My suggestions are below.</p> <p>The abortion data for the years before 2008 are of limited value. The purpose here is to compare abortion trends with trends in use of certain contraceptive methods, and the contraceptive use data are not available for years before 2008. When comparing trends in the text (eg in the section starting on line 179), please provide the abortion trends for the same window of time as the trends in contraceptive use.</p> <p>Lots of data points are given in the text, but it is not so clear what the authors wish to compare with what.</p> <p>It will be helpful to add value labels to Figures 2 and 3, so that readers can compare the magnitude of the trends in the different factors presented. This would require making the figures larger.</p> <p>It appears to me that there is little correlation between contraceptive use trends and abortion trends for 13-17 year olds. The correlation is stronger for the 18-19 year olds. I would hypothesize that in the younger cohorts, the decline in pregnancy rates, where observed, are due partly (or largely) to declines in sexual activity and/or increases in condom use. In the section starting on line 257 the authors cite trends in some measure of sexual activity but they are proxies and don't capture the frequency of intercourse. If there is a correlation between contraceptive use trends and abortion trends in these data, it seems to be in the 18-19 year olds. I encourage the authors to consider these observations and interpretations.</p> <p>Minor: Line 81: I'm not sure I would say that having an abortion itself increases the risk of a subsequent abortion. The first abortion</p>
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	and any subsequent abortion probably have a common cause. I would rephrase or delete.
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VERSION 1 – AUTHOR RESPONSE

Reviewer: 1

Reviewer Name: David Paton

Institution and Country: Nottingham University Business School, United Kingdom

Please state any competing interests: None declared

Please leave your comments for the authors below

This paper presents an overview of trends in teenage pregnancy and use of hormonal contraception in Nordic countries. Teenage pregnancy and abortion rates have decreased in all Nordic countries in recent years. The countries display different trends in use of hormonal contraception over the same period though there has been an increase in the use of LARCs in all countries. On the basis of these trends, the authors argue for improved access to the most effective forms of contraception for teenagers.

Describing the experience of Nordic countries is potentially a useful exercise, particularly in relation to LARCs. There have been relatively few papers examining the impact of LARCs on teenage pregnancy. Understanding the experience of Nordic countries in this area helps to provide more background to the issue. You need to be careful, though. Given that your study is descriptive, it can tell us very little about the causal effect of policy interventions.

The key recent change in behaviour is greater take-up of LARCs. I think the authors should focus more clearly on this. First, given that LARCs were of very little importance until 2000 at the earliest, the presentation of trends in pregnancy & abortion should focus on a more recent period than 1975 (see Figure 1 a-c).

Response: Figure1 a-c and the accompanying text in the Results section and Abstract have been deleted in order to focus on the time period 2008-2015.

Another issue is that it is difficult to pick out trends in LARCs in figures 2 and 3: use of the pill is still much higher than LARCs in every country which means the scale of the Figures makes it hard to pick out what has happened to LARCs. I would present Figures 2 & 3 in two parts: first total hormonal contraception (as at present) and then LARCs on their own. If space is tight, then just present the latter.

Response: A new figure has now been added (new Fig 3 a-c) were only LARC, abortions and births are included. In this figure a different scale is used which makes it easier to identify the increase of LARC. Also Figure 1 (former Figure 2) is updated with a panel of LARC, abortions and births.

A tighter focus on trends in LARCs will allow you to make some more observations about possible impacts. From what I can see, Denmark has seen a much slower rate of increase in the use of LARCs than Norway or Sweden. Yet, I don't see any strong evidence that teenage pregnancy rates have reduced slower in Denmark. You are not trying to test causation here, but that would be consistent with the evidence from the (limited) literature that access to LARCs does not seem to have much impact on pregnancy rates. Indeed, other observations in the paper, e.g. that there seems to be no obvious link between overall use of hormonal contraception and teenage pregnancies (p.9) or between contraceptive subsidies and teenage pregnancy (p.11), fits in quite well with the more

general findings in the literature that access to birth control has very little impact on teenage pregnancy rates. You should emphasise this overall point more.

Some specific comments

Abstract: "A secondary aim was to explore plausible explanations for possible differences" I didn't understand this aim. Do you mean differences over time, between countries or between different age groups? The same comment applies to the bottom of p.4.

Response: "...between countries." has been added at the end of the sentence (line 34).

p.4: Ireland is another Northern European country but with very low rates of teenage pregnancy and teenage abortion (latter based on figures of abortions on Irish teens in Great Britain). It is definitely worth a mention here.

Response: Ireland and references to statistics on birth and abortion rates has been included (line 99).

p.7: as mentioned above, I would focus on birth & abortion rates over the period from when LARCs first started being more easily available, i.e. from after 2000.

Response: Figure 1 a-c and the accompanying text in the Results section and Abstract has been deleted in order to focus on the time period 2008-2015.

p.9: "This indicates high fertility awareness, and effective prevention of unplanned pregnancies by the use of highly effective contraceptive methods". This is incorrect – a reduction in births without abortion rates going up does necessarily indicate this at all. It could just as easily indicate a reduced preference for teenage births caused by some other change in society. It is noteworthy that similar trends have been observed in many countries across the world including those with and without high levels of use of LARCs. I would just delete this sentence.

Response: The sentence has been deleted.

The same comment applies to the first sentence at the top of p.10. Given that abortion rates have gone down in countries irrespective of their approach to LARCs, there is no evidence from this paper that the shift towards LARCs is one reason for the decline in abortion rates. It is quite possible that this is an explanation, but the paper does not give any test of a such a causal influence.

Response: We presume that the reviewer refers to the top of page 11 (in the first version of the manuscript): "... and the steady and on-going decline of the abortions rates which have now reached their all-time-low mark."

The sentence has been rephrased in order to avoid undue presumptions about a causal effect (lines 372-373).

p.11: "Sexuality education programmes have been suggested to lower teenage pregnancy rates ..." Goesling et al (2014) is cited here but that paper does not support the statement. Goesling looks at individual programmes most of which are not sexuality education. Of the 25 programmes which examine in teen pregnancies, only 5 led to a reduction. Of these, most were more general youth development programmes rather than sexuality education. A better cite would be the 2016 Cochrane Review of sex education programmes by Mason-Jones et al which found no evidence that such programmes led to reductions in teenage pregnancy. This is a fairly typical finding so the sentence here should be re-written as something like "Although it is sometimes suggested that sexuality

education programmes lower teenage pregnancy rates, there is little evidence to suggest this is the case ...”

Response: The paragraph has been re-written (lines 395-401) and includes the ref to Mason-Jones.

p.11-12 Similarly, the authors should note that most of the literature suggests that subsidised contraception has rarely been found to have any significant impact on teenage pregnancy rates. Specifically on LARCs, the authors should cite Girma & Paton in Social Science and Medicine (2015) which tests the impact of greater access to LARCs on teenage pregnancy rates.

Response: The paragraph has been re-written and both the reference to Girma & Paton and a reference from Finland have been added in order to nuance the message (413-421).

p.12: the para beginning “In conclusion ...” needs a significant re-write. The paper is descriptive in nature and so says very little or nothing about what factors have led to lower teenage pregnancy in Nordic countries. As noted above, many countries have experienced a reduction on teenage pregnancy and abortions in the past 10 years or so and these countries have a range of experiences in relation to access to contraception. The problem could largely be solved by deleting two sentences: “A multifactorial approach...” and “Thus, interventions that increase ...”

Response: The paragraph has been re-written (lines 429-433).

Reviewer: 2

Reviewer Name: Gilda Sedgh

Institution and Country: Guttmacher Institute, USA

Please state any competing interests: None declared

Please leave your comments for the authors below

This is an interesting paper on an interesting topic. My suggestions are below.

The abortion data for the years before 2008 are of limited value. The purpose here is to compare abortion trends with trends in use of certain contraceptive methods, and the contraceptive use data are not available for years before 2008. When comparing trends in the text (eg in the section starting on line 179), please provide the abortion trends for the same window of time as the trends in contraceptive use.

Response: Figure 1 a-c and the accompanying text in the Results section and Abstract has been deleted in order to focus on the time period 2008-2015.

Lots of data points are given in the text, but it is not so clear what the authors wish to compare with what.

It will be helpful to add value labels to Figures 2 and 3, so that readers can compare the magnitude of the trends in the different factors presented. This would require making the figures larger.

Response: New figures (Figure 1b and 3a-c) have been added to show use of LARC exclusively. It is our intention that this will make it easier to see the magnitude of the different methods, especially LARCs. Also the paragraphs in the Results section, about use of

hormonal contraception, have been re-written in order to leave a clearer message about increasing levels of LARC.

It appears to me that there is little correlation between contraceptive use trends and abortion trends for 13-17 year olds. The correlation is stronger for the 18-19 year olds. I would hypothesize that in the younger cohorts, the decline in pregnancy rates, where observed, are due partly (or largely) to declines in sexual activity and/or increases in condom use. In the section starting on line 257 the authors cite trends in some measure of sexual activity but they are proxies and don't capture the frequency of intercourse. If there is a correlation between contraceptive use trends and abortion trends in these data, it seems to be in the 18-19 year olds. I encourage the authors to consider these observations and interpretations.

Response: Concerning sexual activity a sentence about the lack of studies on sexual activity in the Nordic countries over time has been added (lines 347-350).

When LARC is displayed on its own in figure 3 a small increase is detectable also among 15-17 year olds.

Minor: Line 81: I'm not sure I would say that having an abortion itself increases the risk of a subsequent abortion. The first abortion and any subsequent abortion probably have a common cause. I would rephrase or delete.

Response: The paragraph has been re-written (line 89-90).

VERSION 2 – REVIEW

REVIEWER	David Paton Nottingham University Business School
REVIEW RETURNED	08-Jun-2018

GENERAL COMMENTS	<p>Thanks for doing a careful job of revising the paper in response to my comments and those of the other referee. The paper is much improved. I have a few suggestions on the revision, only the first of which is substantive.</p> <p>New figures: I am glad you are now focusing on a more recent period, but by starting at 2008, you have gone too far in the other direction. By 2008, LARCs had already become quite important and, indeed, much of the discussion in the paper focuses on policy changes in the early & mid-2000s. I recommend you start the graphs at 2000.</p> <p>New Figure 3: please change the scale for the 13-14 and 15-17 graphs to make it easier to see what is going on.</p> <p>Abstract line 49 "... the steepest increase of LARC was seen in, where". I think there is a missing word after "in".</p> <p>p.11, Sexuality education programmes: the re-write reflects the literature a little better but the English needs some work. How about something like this: "It has been suggested that sexuality education programme may lower teenage pregnancy rates by postponing ... it is difficult to draw conclusions about the extent to which programmes actually affect teenage pregnancy rates in practice." Similarly on p.12 line 322, I suggest you change to "It</p>
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	<p>has also been suggested that subsidies of contraceptives can lower teenage pregnancy rates. However Denmark,..."</p> <p>p.12, Norway contraception subsidies: it would be helpful to note what happened to abortion/teen pregnancy in the years following the 2002 and 2006 subsidies. Starting the graphs earlier will help in this regard. I had a quick look at the Norwegian abortion stats and it looks like teenage abortions when down in 2002 and then up again in 2006. If correct, that would suggest very mixed evidence of the effect of subsidies – in keeping with the rest of the paper (and the more general literature). You also need to correct the English at lines 335-6. I suggest, "In 2002 Norway introduced a national-level subsidy of COC ..."</p>
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VERSION 2 – AUTHOR RESPONSE

Thanks for doing a careful job of revising the paper in response to my comments and those of the other referee. The paper is much improved. I have a few suggestions on the revision, only the first of which is substantive.

New figures: I am glad you are now focusing on a more recent period, but by starting at 2008, you have gone too far in the other direction. By 2008, LARCs had already become quite important and, indeed, much of the discussion in the paper focuses on policy changes in the early & mid-2000s. I recommend you start the graphs at 2000.

Response: A new figure including births and abortion 2000-2015 has been added. Data on retrieved prescriptions of contraceptives are not available for 2000-2007, hence we have kept the figures on contraceptive use unchanged.

New Figure 3: please change the scale for the 13-14 and 15-17 graphs to make it easier to see what is going on.

Response: We have tried many different kinds of scales and it is difficult to find a set that fits all figures. We would therefore like to keep the scales unchanged.

Abstract line 49 "... the steepest increase of LARC was seen in, where". I think there is a missing word after "in".

Response: The sentence has been corrected.

p.11, Sexuality education programmes: the re-write reflects the literature a little better but the English needs some work. How about something like this: "It has been suggested that sexuality education programme may lower teenage pregnancy rates by postponing ... it is difficult to draw conclusions about the extent to which programmes actually affect teenage pregnancy rates in practice." Similarly on p.12 line 322, I suggest you change to "It has also been suggested that subsidies of contraceptives can lower teenage pregnancy rates. However Denmark,..."

Response: The sentences have been corrected.

p.12, Norway contraception subsidies: it would be helpful to note what happened to abortion/teen pregnancy in the years following the 2002 and 2006 subsidies. Starting the graphs earlier will help in this regard. I had a quick look at the Norwegian abortion stats and it looks like teenage abortions when down in 2002 and then up again in 2006. If correct, that would suggest very mixed evidence of

the effect of subsidies – in keeping with the rest of the paper (and the more general literature). You also need to correct the English at lines 335-6. I suggest, “In 2002 Norway introduced a national-level subsidy of COC ...”

Response: The paragraph has been deleted since there it does not add anything new to the discussion.

VERSION 3 – REVIEW

REVIEWER	David Paton Nottingham University Business School, UK
REVIEW RETURNED	12-Jul-2018
GENERAL COMMENTS	Happy to recommend this be accepted subject to one typo being corrected: in line 361 "has a higher contraceptive user rates" should be "has a higher contraceptive user rate"